IMPROVED UNDERSTANDING OF FLOW, MIXING, AND GROUNDWATER ACCRETION ON THE SAN JOAQUIN RIVER MAIN STEM THROUGH RAPID ROBOTIC ASSESSMENTS

#0051

Technical Panel Review

Proposal Name: IMPROVED UNDERSTANDING OF FLOW, MIXING, AND GROUNDWATER ACCRETION ON THE SAN JOAQUIN RIVER MAIN STEM THROUGH RAPID ROBOTIC ASSESSMENTS

Applicant Organization: University of California Merced

Principal Lead Investigator(s):
Harmon, Thomas
Kaiser, William
Sprague, Michael

Amount Requested: $1,615,185

TSP Panel Summary of Findings:

While the project is well developed, it appears to be rather expensive. The panel disagreed with the three external reviewers and determined that the topic is not relevant to CALFED's goals. The budget is sufficiently detailed to describe the work to be done, but it is not clear why there is over $400,000.00 for development work for a system that has already been pilot tested on a field scale basis. The work also does not detail why three complete systems are necessary since the upstream and downstream boundaries are well mixed. The USGS isotope study should serve to quantify groundwater inflows. It is unclear what another $400,000.00 plus dollars would add to the answer. If it can be shown that an improvement in the mixing representation of current management models needs improvement then the work would provide advancement in this area. Otherwise the problem involves near−field mixing issues that aren’t relevant to the over−all picture of the Delta and the feeding rivers.

The project's objective to employ the NIMS RD sensor [a product of one of the co−investigators from the NSF−sponsored Center for Embedded Network Sensing (USC, UCLA, UCM, UCR, CalTech)] may already be well on its way to being accomplished. Examination of one page of the Center's website (http://research.cens.ucla.edu/projects/2006/Contaminant/Multiscale_ENS_T

) reveals duplicates of some of the figures shown in the proposal, which along with the text in the website (which is also partially duplicated in the proposal) seems to illustrate that the application of the NIMS RD methodology to this and other similar applications at different sites is either planned or already underway (reference to NEON and CUASHI for example). Are funds being asked for to supplement NSF funds for on-going demonstration of the NIMS RD? What is novel about this part of the project compared to what NSF or others are already supporting? Perhaps the answer is that the methodology needs to be perfected, but that is not clear from the proposal. In any case, the more relevant question is, what are the innovations being proposed to utilize data obtained in this way, either from the NIMS RD or other autonomous samplers (of which the authors list two or three examples)? That is not clear from the proposal. Moreover, one of the external reviwers notes the "lack of convincing detail on data analysis/modeling methods and the lack of published expertise in this area by the team."

Relevance to PSP Topic Areas:

Very Low

TSP Technical Rating:
Sufficient

TSP Funding Recommendation:
Do Not Fund

TSP Amount Recommended: $**0**

Conditions:

External Technical Review #1

Proposal Title: IMPROVED UNDERSTANDING OF FLOW, MIXING, AND GROUNDWATER ACCRETION ON THE SAN JOAQUIN RIVER MAIN STEM THROUGH RAPID ROBOTIC ASSESSMENTS

Proposal Number: 0051

Proposal Applicant: University of California Merced

Purpose

Comments	**The objectives and hypothesis are clearly stated, and but lack internal consistency. In particular, the proposed research focuses on implementing a robotic data collection network to acquire 2D data for water quality analysis, but the method for data analysis and expected results (e.g. predictive models, reports) were not described in detail. The project is a full-scale implementation project. Real-time multi-dimensional flow and water quality data are needed and important for better delta management. The flow and geomorphology data collected from this robotic network will be very useful in bay delta management. The objectives of proposed river modeling study, water quality analysis, and groundwater accretion study are not very clear.**
Rating	**Above Average**

Background

Comments	**The conceptual model clearly stated the needs of accurate 2D flow and water quality data for improving understandings of flow, mixing, and groundwater accretion in the study site. However, the conceptual model does not describe how these real-time 2D data will be used in analysis or modeling. As far as the reviewer's knowledge, many 2D/3D hydrodynamic models have been developed for the study**

	reach. The proposed research may overlap the existing efforts. In other word, what are the new contributions of the proposed 2D model study and the groundwater study? The newly collected data can be used by other project teams to verify their hydrodynamic and water quality models. The project compliments other on−going projects in other agencies (e.g. USGS, UC−Davis). Background information regarding other hydrodynamic modeling studies and other exiting data are not complete.
Rating	Above Average

Approach

Comments	The approach including equipment, setup, and accuracy to collect accurate 2D data has been stated thoroughly. The method for data analysis and modeling does not seem to be important in the proposed research. The reviewer recognized the importance of the new data, but can not tell how these data will be used to improve understanding of mixing and dynamics.
Rating	Sufficient

Feasibility

Comments	The proposed project is a full−scale implementation project, and is likely to succeed in implementing real−time data collection network. The data analysis and modeling don’t have a detail description, so the reviewer has some doubts. The PIs are highly competent in the proposed research.
Rating	Sufficient

Budget

Comments	**The proposed budget is adequate for the proposed work. The equipment part is expensive (over $650,000). If these data are essential, the reviewer recommended funding to the data collection part.**
Rating	**Sufficient**

Relevance To CALFED

Comments	**This proposal addressed a priority addressed in PSP, and it also integrates with other on-going research projects. The key contribution of the proposed research is the innovative data collection method that will obtain real-time 2D flow and water quality data for many research teams to use. The newly obtained data is very useful to CALFED resource management. They will become useful to policy makers after being carefully analyzed or applied into models.**
Rating	**Superior**

Qualifications

Comments	**The proposal team is qualified for the proposed project. However, the research team lacks publications in peer-reviewed journals in the area of river modeling and water quality analysis.**
Rating	**Above Average**

Overall Evaluation Summary Rating

Comments	**In general, the proposed project addressed an important missing link in CALFED program. 2D real-time robotic data is necessary for understanding hydraulics, water quality, river mechanics, pollutant transport, etc. in waterways and estuarine. These data become more and more important for evaluating the credibility and accuracies of other modeling studies.**

	However, the component of data analysis and modeling is relatively weak in the proposal. The proposed project can be partially funded.
Rating	**Above Average**

External Technical Review #2

Proposal Title: IMPROVED UNDERSTANDING OF FLOW, MIXING, AND GROUNDWATER ACCRETION ON THE SAN JOAQUIN RIVER MAIN STEM THROUGH RAPID ROBOTIC ASSESSMENTS

Proposal Number: 0051

Proposal Applicant: University of California Merced

Purpose

Comments	**The goals, objectives and hypotheses are clearly stated and internally consistent in the proposal. The primary objective of the project is to measure spatial and temporal variation of water quantity/quality parameters along San Joaquin River and apply the measured data to develop models that will address the likelihood of future water quality variation along the river basin.** **Sub−objectives of the project are:** **1.measure flow velocity and salinity at different sections of the river channel for a variety of flow conditions 2.Develop salt load rating curve, i. e., EC*V 3.Find cross sectional distribution of water quality parameters e.g., temperature, pH, dissolve oxygen, oxidation−reduction potential, nitrate 4.Create analogous rating curve for nitrate 5.Understand the hydraulic control on confluence zone and develop two dimensional river flow and transport models for mixing parameters 6.Provide local mass balance estimates of flow and chemical transport in the river channel** **The results will be helpful to specially calibrate 2−D models for water quality issues. That may supersede existing novelties of CALSIM II. As they have explained that they will apply Mike 21 model, which is**

	very successful commercial model used worldwide. The probability of generating novel information is very high.
Rating	Superior

Background

Comments	The conceptual model has been clearly stated in the proposal. Figure 3 on page 4 clearly shows how the distributed groundwater accretions, distributed stream and drainage inputs will be considered in the model. Moreover, the confluence points of four rivers and the potential location of gauge station will be helpful to collect water quality and quantity data at all flow conditions. All information required to understand the basis for the proposed work has been well documented.
Rating	Superior

Approach

Comments	The approach is very well designed and is appropriate for meeting the objectives of the project. They have divided the approach into six major tasks. They are: 1.Project management 2.NIMS RD acquisition, testing and maintenance 3.Merced confluence mixing zone study 4.Tuolumne confluence mixing zone study 5.Stanislaus confluence mixing zone study 6.Ground water accretion study Management, administration, research, and outreach activities and corresponding responsibilities are very clearly stated in the proposal. Since the experts from diverse disciplines are involved, the probability of success rate will be high.
Rating	Superior

Feasibility

Comments	**The technical documentation of the approach is very clear and concise. They have explained in detail about NIMS RD sensor, sensor calibration parameters, precision levels, etc. The data acquisition, maintenance and its levels of details are mentioned in the proposal. The confluence mixing and study approach have been divided into four sub tasks, which shows the level of details on each task. This will certainly provide all level of details to be performed during implementation. Further, the level of details on confluence zone NIMS RD deployment schedule helps to figure out the critical flow patterns with respect to both quality and quantity issues. The likelihood of success is certainly very high and the scales of the project objectives are within the grasp of authors.**
Rating	**Superior**

Budget

Comments	**The budget is clear on how much will be required to accomplish each task. They have prioritized the tasks and divided tasks into sub tasks. Accordingly, they have allocated the budget. It is also clear from budget summary that how much will it cost to buy sensor, to maintain it and also the budget is clearly allocated for lab and field supplies, computer work stations etc. Budget seems reasonable.**
Rating	**Above Average**

Relevance To CALFED

Comments	**The proposal addresses the priority lists in the PSP very well. For example, the research area is within the San Francisco bay delta system. The project team involves highly interdisciplinary experts from various disciplines, e.g., environmental engineering, mathematics, and electrical engineering**

	background. The proposal is directly related to CALFED's environmental water priority topic. The objectives are to determine more detailed water quality forecasting procedure than in the past. The project objectives are clearly visible and to the point that address the emerging issues of water quality forecasting in the delta bay system.
Rating	**Superior**

Qualifications

Comments	**The project team is very well qualified and track record of authors is excellent. Yes, they do have available infrastructure and other aspects of support necessary to accomplish the project.**
Rating	**Superior**

Overall Evaluation Summary Rating

Comments	**Problem identification, theoretical perspectives, scientific rationales, and approaches are very clearly described in the proposal. Each objective has been clearly addressed and the solution approach of each objective has been mentioned in the proposal. The proposal is very comprehensive and it touches each detail to be listed in the proposal. The conceptual model, modeling framework, data collection, sensor type, its use, application, maintenance, the site selection and monitoring, the data collection methodology, data analysis and modeling details, etc., are clearly depicted in the proposal. Moreover, the project deliverables, budget summary, work schedule and the task division of each team member have been very clearly mentioned in the proposal. It can be anticipated that the likelihood of success of such project is definitely high and the information to be obtained from the project will be of valuable to CALFED decision makers.**
Rating	

	Superior

External Technical Review #3

Proposal Title: IMPROVED UNDERSTANDING OF FLOW, MIXING, AND GROUNDWATER ACCRETION ON THE SAN JOAQUIN RIVER MAIN STEM THROUGH RAPID ROBOTIC ASSESSMENTS

Proposal Number: 0051

Proposal Applicant: University of California Merced

Purpose

Comments	**The goals, objectives, and hypotheses are clearly stated. The authors present a unique approach to assessing mixing and flow in streams using a robotic approach. Their technique will provide managers with information that is currently difficult to obtain. Full-scale implementation as proposed is warranted. Successful completion of this work will have wide applicability. The information obtained will relate to water quality, groundwater-surface water interactions, and mixing in streams.**
Rating	**Superior**

Background

Comments	**The conceptual model is clearly elucidated and amply documented. Sufficient information is provided to understand the concept and its application.**
Rating	**Above Average**

Approach

Comments	**The experimental design is very good and will be able to satisfy the objectives. Tasks are well-defined and allocated. The information dissemination plan is very good – considerable thought went into producing something other than the usual reports, conference presentations, and journal articles. The authors have**

	made a conscious effort to inform stakeholders by the "usual means", plus development of educational modules and training sessions.
Rating	Above Average

Feasibility

Comments	The approach is well-documented and feasible. The likelihod of success is good - keep in mind that this is new technology so pitfalls do exist. It is not a "sure thing". However, the potential benefits far outweigh the risks. The team is strong, well-versed in the technology, and well-qualified to complete the tasks outlined.
Rating	Above Average

Budget

Comments	The budget is reasonable - keep in mind that the equipment is expensive and the tasks complex. It is clear what the funds are purchasing.
Rating	Above Average

Relevance To CALFED

Comments	The authors have made an excellent case for this project's relevance to CALFED priorities. The project is multidisciplinary and involves modeling. The results will aid CALFED resource managers and other stakeholders - especially if the methods are applied to other streams in the system.
Rating	Superior

Qualifications

Comments	The team is highly-qualifed with an overall excellent track record and fully capable of executing this work. The infrastructure and support are available and more than adequate.

Rating	**Superior**

Overall Evaluation Summary Rating

Comments	**This work is innovative and the technology to be used could have great applicability and profound implications. Information will be obtained on mixing in streams, water quality, and groundwater accretion. The project is expensive but the equipment cost and operation/maintenance are the main reasons. Payoff is likely to be quite high.**
Rating	**Superior**